Santa Clara Valley Water District

# LOS GATOS CREEK
# REPORT
# OF
# PLANNING STUDY

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425
L673.R3
1976

APRIL 1976

TC 425 L 675 R3 1976 c.3

SANTA CLARA VALLEY WATER DISTRICT

# REPORT

# OF

# PLANNING STUDY
(Pursuant to Section 10, SCVWD Act)

# FOR

# LOS GATOS CREEK

# (KIRK DAM TO VASONA DAM)

CENTRAL ZONE

PROJECT NO. 3020

APRIL 1976

Report prepared by Predesign Division Staff

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Lloyd C. Fowler
Chief Engineer

DISTRICT BOARD OF DIRECTORS

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Santa Clara Valley Water District

5750 ALMADEN EXPRESSWAY
SAN JOSE, CALIFORNIA 95118
TELEPHONE (408) 265-2600

March 16, 1976

Board of Directors
Santa Clara Valley Water District
5750 Almaden Expressway
San Jose, California 95118

Gentlemen:

Transmitted herewith is the Report of Planning Study on Proposed Flood Protection Measures on Los Gatos Creek (Kirk Dam to Vasona Dam), Project No. 3020, in Zone C (Central) of the Santa Clara Valley Water District.

The report describes the potentials for damage from flooding and erosion in the community, considers the beneficial and adverse impacts which would arise from a flood protection project and alternatives to it, and concludes that flood protection should be provided in the area.

The recommended project between Kirk Dam and Lark Avenue consists of removing Kirk Dam, lowering the channel bottom, excavating floodplains, and enlarging the waterway opening beneath the Lark Avenue bridge. Upstream of Lark Avenue to Vasona Dam, the proposal is to remove flood impeding vegetation only and to install an earth berm on the east bank. This project is consistent with County and City General Plans.

The estimated cost of the recommended project is $1,586,000 and can be financed from Central Zone tax revenues.

I concur in the project as proposed and recommend a public hearing be held as a prerequisite to the construction of proposed improvements and acquisition of right of way.

Sincerely yours,

John T O'Halloran

John T. O'Halloran
General Manager

Enclosure

AN AFFIRMATIVE ACTION EMPLOYER

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# INTRODUCTION

The purpose of this Planning Study is to determine the extent of the flooding or flood related problems of that portion of Los Gatos Creek between Kirk Dam and Vasona Dam, and to recommend a course of action to resolve the problems identified. This report presents a discussion of these items and recommends a course of action. The recommendation considers the present land use of the flood prone area and future land use plans of the Town of Los Gatos for the area. Also, it results from careful consideration of the views of the local community including residents adjacent to this reach of Los Gatos Creek.

The proposed plan will (1) give immediate guidance to the Town for locating continuing community development in the area, and (2) be the basis for final planning and future construction of a protection project on Los Gatos Creek.

This report will be circulated to the public along with a draft of the environmental impact report. After a circulation period of 30 days, a formal Public Hearing on both documents will be held by the District Board of Directors. The public is encouraged to comment on both reports during the circulation period and at the formal Public Hearing. Following the Public Hearing, the Planning Study Report will be modified as appropriate by the public input and if the changes are deemed significant enough, the environmental impact report will be extended to consider such changes and another formal Public Hearing will be set. If no changes or only minor changes are made in the proposed plan, the study and environmental impact report will be finalized and placed on the agenda of a regular meeting of the Board of Directors.

This report presents the findings of the planning study and consists of:

1) A description of the Los Gatos Creek Watershed and of the flooding and erosion problems.
2) A discussion of the design criteria used.
3) A description of the alternatives investigated and the proposed measures including an estimate of the cost, the staging of construction and project financing.

## DESCRIPTION OF WATERSHED

Los Gatos Creek is located in the Central Zone of the Santa Clara Valley Water District with the major portion of its watershed in the unincorporated area of the County and the balance in the Town of Los Gatos and the Cities of Monte Sereno, Campbell, and San Jose. The creek flows in a well defined channel from its origin in the Santa Cruz Mountains to its confluence with Guadalupe River. Figure 1 is a map of the Los Gatos Creek watershed and illustrates the general topography of the area.

The total watershed area of Los Gatos Creek is 55 square miles of which about 37.5 square miles are located in the Mountainous regions partially forested with redwood and douglas fir trees with large areas of dense chaparal. The remaining 17.5 square miles are located in the foothills and on the valley floor, and generally covered by medium to heavy density urbanized areas. The mean annual precipitation of the Los Gatos Creek watershed varies from 52 inches above Lexington Reservoir to 14 inches on the valley floor.

As Los Gatos Creek emerges into the valley, its northeasterly meandering course has cut a broad, nearly flat bottomed entrenched floodplain into the previously deposited Santa Clara Formation and old alluvium which occurs as terrace deposits. The entrenched floodplain contained by steeply sloping to nearly vertical lateral walls from its emergence into the valley floor to about Lark Avenue is about one-half mile wide and 50 feet deep. The young stream deposited alluvium in the flat bottomed plain consists of about 25 feet thickness of loose and permeable sand and gravel with lesser amounts of sandy clay, silt and clay. The walls of the canyon and beneath the young channel alluvial fill are older, gently folded or slightly tilted (downstream) Santa Clara Formation and older terrace alluvium consisting of compacted to loosely consolidated, massively bedded clayey or silty gravel, sandy clay, and sandy silt. The current stream channel, as it meanders along the young alluvial plain, has entrenched into the flat bottom surface.

Downstream of Lark Avenue to Kirk Dam, the same stream section configuration persists but on a lesser depth of the entrenchment and with gently sloping lateral walls. Young stream alluvium occurs within the confines of the lateral walls to a depth of about 20 to 30 feet and the older alluvium occurs beneath the young alluvium and forms the lateral walls.

The project area occurs in the southwestern edge of the North Santa Clara Valley groundwater basin, a major groundwater basin of California. Due to its shallow depth in the project area, the young alluvial deposits allow nominal groundwater recharge. Just downstream of the project area where

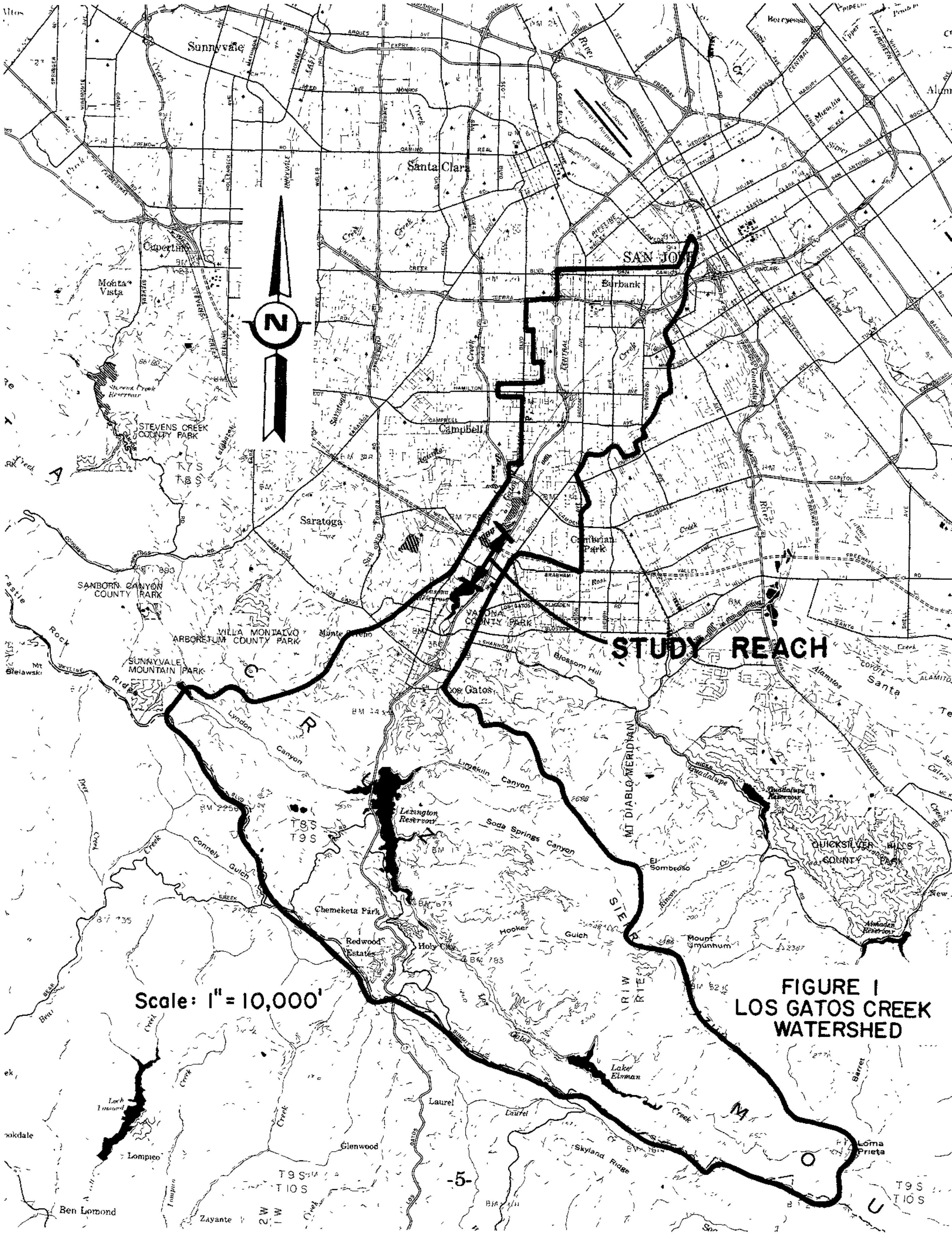

FIGURE 1
LOS GATOS CREEK
WATERSHED

the depth of the permeable young alluvial deposits increases, a significant recharge zone occurs. There the District has constructed groundwater recharge ponds along the stream channel. The promotion of groundwater recharge plays a significant part of the District's operation to augment groundwater supply and contributes to the prevention of land subsidence in the central valley. Upstream reservoirs store storm waters for later release to these groundwater recharge areas.

Located along Los Gatos Creek are four water conservation reserviors; Williams, Elsman, Lexington and Vasona. Williams and Elsman Reserviors are owned and operated by the San Jose Water Works while Lexington and Vasona are owned and operated by the Santa Clara Valley Water District. Their purpose is to intercept and store seasonal runoff from the watershed for regulated releases downstream. Water from Williams and Elsman Reservoirs is treated at San Jose Water Works' Montevina Plant and retailed directly for domestic consumption while water from Lexington and Vasona Reservoirs is released downstream for groundwater recharge. The total storage available in these reservoirs is 27,000 acre-feet which compares with the mean annual runoff above Lexington Dam of 27,000 acre-feet. The operation of the water supply reservoirs provides an average yield of about 15,000 acre-feet per year or 55 percent of the storage.

The floodable area within the study reach (Vasona Dam to Kirk Dam) generally consists of medium to heavy residential density and medium commercial density. Tentative plans from the State Department of Transportation indicate that Route 85 (West Valley Freeway) will cross Los Gatos Creek within the study reach (refer to Figure 1). Downstream of the study reach, flood control measures have been completed to Campbell Avenue. The following section will describe in detail the flood and erosion problems for the study reach of Los Gatos Creek.

## DESCRIPTION OF THE PROBLEM

Flooding hazards exist along the entire study reach (refer to Figure 2). Downstream of Lark Avenue the existing creek has a capacity to convey a flood that has a ten percent chance of being equalled or excedded in any one year (approximately 4,000 cubic feet per second) while upstream of Lark Avenue, capacity is sufficient to convey a flood that has a two percent chance of being equalled or exceeded in any one year (approximately 9,000 cubic feet per second).

Potential floodwater depths for the one pecent flood vary from approximately three feet in the Charter Oaks area and in the areas immediately adjacent to the east bank to sheet flow depths of one foot along the embankment of Highway 17. Approximately 320 residential units and 11 commercial units are directly affected by this flooding while 4 industrial units and 2 commercial units are affected by potential damage from erosion. Lark Avenue would be virtually impassable during these flooding conditions. Projected land use based on the Los Gatos General Plan indicates that even greater potential for structural damage will exist as remaining agricultural lands are urbanized.

Two of the more important characteristics of urbanization that affect flood flows are changes in the imperviousness of the basin due to roofing and paving and the existence of storm drainage facilities and channelization, i.e., improvement of the stream channels. The storm water falling on impervious parts of the basin are transferred into surface runoff with little loss, while the storm drainage facilities and the improved channel cross sections reduce the overbanking and associated floodplain storage as well as speed up the flows, causing a sharp increase in the peak flows of small, more frequent floods. Larger floods, however, like the one percent design flood (see Design Criteria) are little affected by urbanization. This is because the rainfall that precedes larger floods saturates the soils of an unurbanized basin in a way that renders their characteristics similar to the imperviousness caused by urbanization.

Los Gatos Creek has a documented history of flooding. The most noteworthy, in the earliest days of the valley's growth, being the floods of the 1860's as told in *History of San Jose* by James and McMurry:

> "The Los Gatos and Guadalupe Creeks overflowed in severe floods of March 1862 and December 20, 1867 – in the latter the Los Gatos Creek cut out its present course..." "The severest flood of American times (February 8, 1869)...backed the waters four feet deep south of Santa Clara Street."

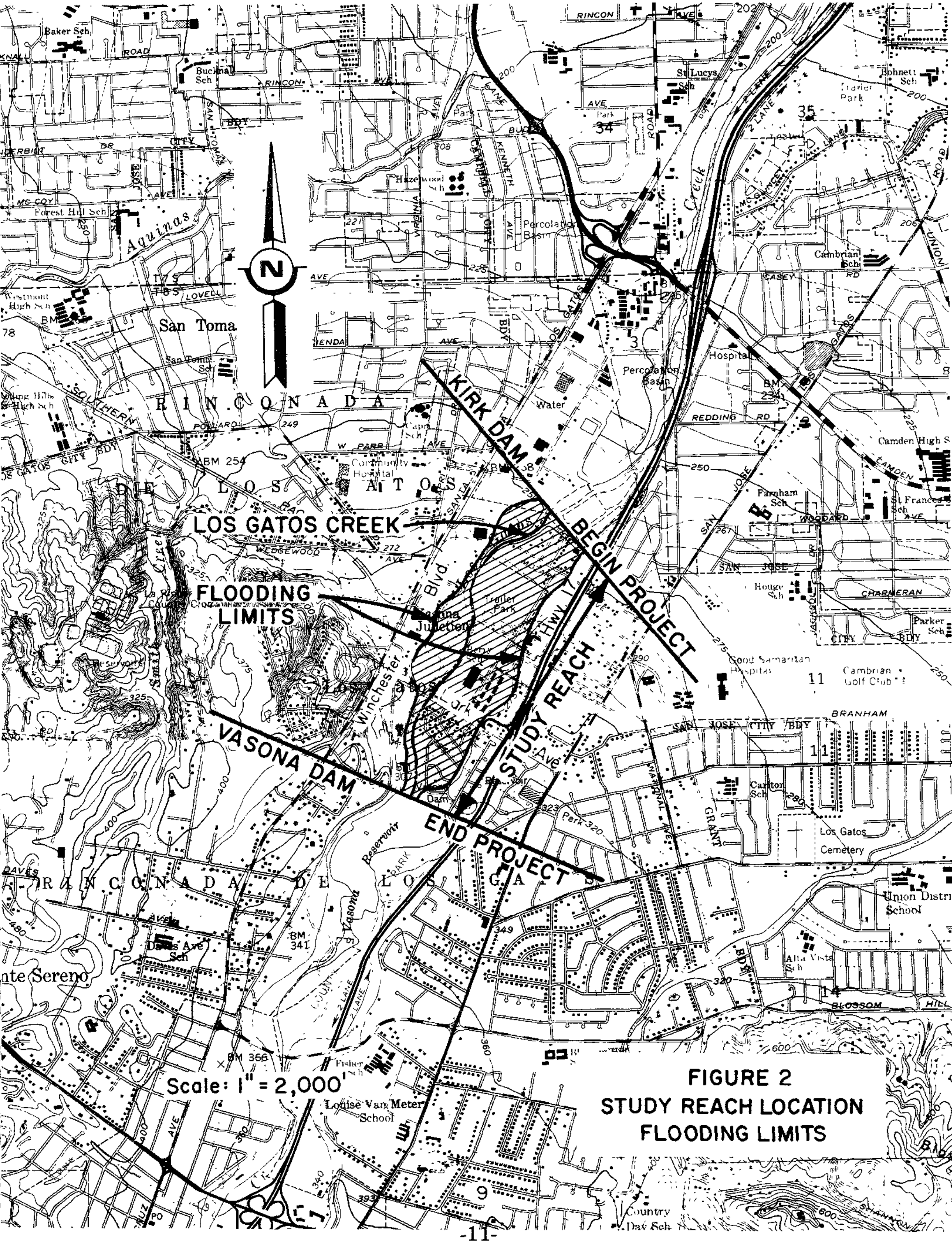

FIGURE 2
STUDY REACH LOCATION
FLOODING LIMITS

There have been dramatic floods in more recent years and since 1930 the following high flow rates have been recorded by the U. S. Geological Survey at a stream gage located just below the present Lexington Damsite (Drainage Area - 38.6 square miles).

Highest unregulated flows (1930-1952)

| | | |
|---|---|---|
| 1. | 7110 cfs | February 27, 1940 |
| 2. | 5800 cfs | January 12, 1952* |
| 3. | 5600 cfs | February 1, 1945 |
| 4. | 5500 cfs | February 13, 1937 |

Highest regulated flows (1952-1974)

| | | |
|---|---|---|
| 1. | 3540 cfs | April 2, 1958 |
| 2. | 3530 cfs | March 16, 1967 |
| 3. | 1660 cfs | February 2, 1963 |

The San Jose Mercury Herald provides a good account of the effects of some of these larger flows:

> *February 28, 1940*
> "...Los Gatos Creek, only major north county stream not controlled by a storage dam, went on a solo rampage, destroying a 48-year-old diversion dam, undermining embankments and threatening bridges..."
> "The muddy water marked highest flow in the stream since 1911."
>
> *February 14, 1937*
> "Ditch levees just below Page Dam, south of Campbell, gave way last night, spreading through orchards and driving several families from their homes..."

Following the assessment of the flood and erosion problems of the study area, the design criteria was established for use in evaluating alternative flood control measures available to resolve these problems. These criteria are described in the next section of the report.

---

* Elsman Reservoir was constructed in 1950 and regulates 36 percent of the drainage area.

## DESIGN CRITERIA

The criteria used in the examination of flood and erosion control alternatives for Los Gatos Creek are derived from accepted engineering practices. Economic evaluations of alternatives were based on 1975 estimates of construction costs and include engineering and inspection costs estimated at 35% of the construction cost, landscaping costs, current right of way values and the present worth of possible future maintenance costs.

Design flood flows were computed using the results of a regional flood frequency hydrologic analysis. This is a generalized hydrologic method developed by the District as a result of the need to estimate floods and their frequency of occurrence on gaged and ungaged basins for the design of flood control facilities and the desire to provide uniform protection Districtwide.

For this purpose the historic annual peak floods of 15 stream flow stations on other streams in the hydrologically similar area were used. The statistical parameters (mean and standard deviation) of the records from these stations were correlated with the hydrologic and geomorphic characteristics of their respective basins. A set of equations was obtained which define the general relationship between the statistical parameters and basin characteristics such as mean annual precipitation, basin area, a shape factor and the bifurcation ratio. The last two parameters relate to basin efficiency. Moreover, since a portion of Los Gatos Creek watershed is highly urbanized, special considerations were given to the design flows accounting for all the tributary flows through the system of existing storm sewers within the watershed.

Runoff hydrographs for Los Gatos Creek were developed from Clark's synthetic unit hydrograph and the 24-hour standard storm distribution used by the Corps of Engineers. The peak and 24-hour volumes were balanced to match the values from the regional regression equations. The hydrograph was routed through the three reservoirs (Williams Reservoir being excluded due to its relatively small size) assuming that each was initially at full capacity and urban areas were treated using the methodology explained above.

It is necessary to assume full reservoirs because they are water conservation facilities whose purpose is to intercept and store seasonal runoff for water supply. Releases are not made to allow storage for flood control purposes. Therefore, if early seasonal runoff fills the reservoir, they will generally remain full for the banalce of the rainy season. It should be noted, however, that surcharge storage on even a full reservoir does reduce the peak flow. This phenomenon was taken into account in determining the design flows.

Using the above-mentioned regional formulas, the peak flows for 20, 50, and 100-year return period floods were calculated, although only the 100-year or 1 percent results were used for design. A 1 percent return period flood peak is that flood peak that has a one percent chance of being equalled or exceeded each year. The deisgn flows are summarized in Table 1.

Hydraulic design for the project involved an investigation of the discharge carrying capacity of the existing channel to locate those reaches which are flood-prone, and to establish, where possible, the limits of flooding.

Water surface profile computations utilizing design flood flows derived as described above, were performed beginning at Upper Page drop structure in Campbell and proceeding upstream to Vasona Dam. The many factors influencing depth of flow in an open channel, such as channel roughness, slope, cross-sectional shape, and design discharge were analyzed. The normally tedious calculation of the water surface profile, involving iterative mathematical techniques, were facilitated by the use of the U.S. Army Corps of Engineers' computer program *Water Surface Profiles*. The computations yielded specific data regarding depths of flood flows in the creek as well as expected water velocities which must be accommodated to prevent erosion.

# TABLE 1

## Los Gatos Creek
## Flow Summary for 1% Design Flood

| | Drainage Area | Flow (cubic feet per second) |
|---|---|---|
| Inflow to Elsman | 9.91 sq.mi. | 6800 |
| Outflow from Elsman | 9.91 sq.mi. | 4900 |
| Inflow to Lexington | 37.52 sq.mi. | 17900 |
| Outflow from Lexington | 37.52 sq.mi. | 11800 |
| Outflow from Vasona | 43.98 sq.mi. | 12900* |
| Flow at Guadalupe River | 54.83 sq.mi. | 14000 |

*Utilized for Project Reach (Kirk Dam to Vasona Dam)

# DISCUSSION OF STUDY FINDINGS

Preliminary studies for this project included analyses of various flood control alternatives considering hydraulic criteria, hydrology, economics, soil characteristics, existing terrain, present and projected land use, reservoir storage, ecology and aesthetics. In the initial refinements, the resultant alternatives based on the above considerations included: (1) no project, (2) possible flood control storage in existing reservoirs, (3) concrete-lined channel, (4) fully excavated trapezoidal earth channel with drop structures, (5) modified floodplain channel which utilizes existing natural low-flow channel conditions in conjunction with set back levees, (6) modified floodplain channel with bank excavation and floodwalls (or a combination thereof) to control the flood flow width without altering the natural low-flow channel, (7) diversion channel, and (8) modified floodplain channel with limited excavation of the existing channel.

The alternatives were evaluated considering their relative degrees of social, economic, and environmental impacts together with factors of cost, engineering judgment and compatability with adjacent reaches of the stream. Considered in the evaluation were comments and recommendations received from local citizens at various meetings held at District headquarters and in the Los Gatos Town Council Chambers.

The alternatives analyzed are presented in Table 2 which summarizes the evaluation process. Out of the developed analysis and review the one acceptable solution seems to be Alternative 8. This consists of removal of the existing Kirk Dam, fencing along the right of way in selected locations, limited channel excavation, erosion protection in selected locations, selected removal of vegetation, limited grading and dressing of side slopes, floodplain excavation, modification to the flow area under Lark Avenue bridge and an earth berm in certain locations upstream of Lark Avenue. A full discussion and description of the recommended alternative (Alternative 8) is included in the following section of this report.

## TABLE 2
## ALTERNATIVE EVALUATION SUMMARY

| CONSIDERATION | ALTERNATIVE | | | |
|---|---|---|---|---|
| | (1) No Project (Flood Insurance) | (2) Flood Control Storage in Existing Reservoirs | (3) Concrete Channel | (4) Excavated Earth Channel with Drop Structures. |
| Social Implications | Generally inconsistent with community desires. | Flood hazard reduced but still existent. Some land and structures remain floodable. | Generally inconsistent with community desires. No recreation potential. | Generally same as concrete channel, but slightly better recreation potential. |
| Economic Effects | Land use restriction and flood insurance requirements due to flood hazard. $1,584,000 damages to structures, from one 1% flood. $943,000 flood insurance costs over 50-yr period. | Reduces limits of flooding along entire creek. Some land use restrictions remain. | Eliminates flood hazard thus raising property values. Existing structures and land would be protected. | Some as concrete channel, but more expensive to maintain. |
| Environmental Impact | Existing natural resources remain unaffected. | Some flood control measures must be taken to confine remaining flood magnitudes. Hence, some environmental impact on channel. | Majority of vegetation would be removed. | Same as concrete channel, but better possibility of reestablishing vegetation. |
| Project Cost | 0 | $5,338,000 | $2,040,000 | $1,619,000 |

TABLE 2 (continued)

ALTERNATIVE EVALUATION SUMMARY

| CONSIDERATION | ALTERNATIVE | | | |
|---|---|---|---|---|
| | (5) Modified Floodplain (Leveed) No Channel Excavation | (6) Modified Floodplain (Excavated) No Channel Excavation | (7) Diversion Channel | (8) Modified Floodplain (Excavated) With Channel Excavation |
| Social Implications | Generally inconsistent with Town of Los Gatos desires due to 6' to 7' levee height impairing view. Requires relocation of approximately ten mobile homes. Readily adaptable for recreation. | Generally inconsistent with community desires. Virtually entire mobile park must be relocated. School playground adversely affected. Readily adaptable for recreation. | Same as modified Floodplain | Generally consistent with community desires. Requires relocation of one mobile home. No other residential or commercial structures affected. Readily adaptable for recreation. |
| Economic Effects | Eliminates flood hazard thus raising property values. Remaining structures and land would be protected. | Same as Modified Floodplain. | Same as Modified Floodplain. | Same as Modified Floodplain. |
| Environmental Impact | Existing channel remains in present natural condition. No vegetation or creek habitat affected. | Same as Modified Floodplain. | Same as Modified Floodplain. | Affects some bush type vegetation. Trees unaffected. Readily adapatable to natural habitat reformation. Affords semi-natural setting. Existing channel affected. |
| Project Cost | $1,724,000 | $1,865,000 | $2,084,000 | $1,586,000 |

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*********************************************  STREAMFLOW  SEASONAL  STATISTICS  *********************************************
*                                                                                                    RUN DATE    2/10/82   *
* STN  INDEX    STATION NAME                          WATERSHED                        MEASUREMENTS             GAGE                       *
* NO.  NUMBER   KIRK DITCH                            AREA(KM2)   LATITUDE LONGITUDE   BEGAN  ENDED   CTY  OPER  TYPE    SEASON      PAGE *
*  47  168675     AT HEAD                                0.0      37/15/39 121/57/13   1970   CON'T    43   43    1U     1981=82        1 *
*****************************************************************************************************************************************
*                                                                                                         SEASON                YEAR    *
*    SEASON       OCT     NOV     DEC     JAN     FEB     MAR     APR     MAY    JUNE    JULY     AUG    SEPT     TOTAL      YEAR   TOTAL    *
*                                                                                                                                       *
*    1969=70        0       0       0    1083    1066    1700    1483     758     495    1911    1508    1281     11287      1970   15565    *
*    1970=71      944    1481    1855    1718    1591    1699     852     245     473     620    1530    2343     15351✓     1971   13698    *
*    1971=72     2056     286     285    1699     997      55     263      40      30      28      34     449      6223✓     1972   10797    *
*    1972=73     2391    2328    2482    1768    1361    1914    1095    1930    1605    2089    1884    1389     22237✓     1973   17930    *
*    1973=74     1028    1032     835     555     126     151    1126    1673    1589    2306    2206    2042     14671✓     1974   17516    *
*    1974=75     2217    1824    1701    1674    1419    1045    1014    1051     875    1677    1477     265     16237✓     1975   15614    *
*    1975=76     1373    2059    1687    1248    1576    1363    1995     425     542     596     588    1277     14728✓     1976   11958    *
*    1976=77     2263    2361      54      44       0       0       0       0       0      15      20     384      5141✓     1977     848    *
*    1977=78      292      93       0    1028    1508    2049    2193    1848    1148    1979    2184    1464     15787✓     1978   20894    *
*    1978=79     2055    2056    1381    1434    1155    1569    1522    1095     490     647     643     596     14645✓     1979   14416    *
*    1979=80     1414    1822    2027    1819    1395    1253    1582    1636    1367     814    1899    1279     18306✓     1980   17766    *
*    1980=81     1283    1972    1468    1323     583     819     930    1172      98      19      19     640     10327      1981   *****    *
*                                                                                                                                       *
*    MEAN        1443    1443    1148    1283    1065    1135    1171     989     726    1058    1166    1117     13745             14273    *
*    STD DEV      752     835     841     518     525     699     613     669     558     839     818     636      4626              5058    *
*                                                                                                                                       *
* NOTE:  VOLUMES IN 1000'S OF CUBIC METRES                                                                                              *
*****************************************************************************************************************************************
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```
********************************************** STREAMFLOW  SEASONAL  STATISTICS ************************************************
*                                                                                                        RUN DATE   2/10/82    *
* STN  INDEX    STATION NAME                    WATERSHED                        MEASUREMENTS             GAGE                    *
* NO.  NUMBER   UPPER PAGE DITCH                AREA(KM2)   LATITUDE LONGITUDE   BEGAN  ENDED   CTY  OPER  TYPE    SEASON     PAGE *
*  53  168700    AT HEAD                           0.0      37/15/45 121/57/14   1935   CON'T    43   43    1U     1981-82       1 *
**********************************************************************************************************************************
*                                                                                                      SEASON              YEAR    *
*    SEASON      OCT    NOV    DEC    JAN    FEB    MAR    APR    MAY   JUNE   JULY    AUG   SEPT      TOTAL      YEAR    TOTAL    *
*                                                                                                                                   *
*    1934-35       0      0      0   1079      0    643   2576    421      0      0      0      0       4719      1935     4719    *
*    1935-36       0      0      0    294   1798   1813   1133      0      0      0      0      0       5038      1936     5038    *
*    1936-37       0      0      0      0   3623   3672   3381      0      0      0      0      0      10676      1937    11273    *
*    1937-38       0      0    597     88    881   1385   2589    357      0      0      0      0       5897      1938     5300    *
*    1938-39       0      0      0      0      0      0      0      0      0      0      0      0          0      1939        0    *
*    1939-40       0      0      0   1094   2016   1187    805      0      0      0      0      0       5102      1940     5537    *
*    1940-41       0      0    435   1240    631   1010    621    695      0      0      0      0       4632      1941     4623    *
*    1941-42       0      0    426    577   1008   1321   1045    438      0      0      0      0       4815      1942     4389    *
*    1942-43       0      0      0    125   1086   1282    678      0      0      0      0      0       3171      1943     3171    *
*    1943-44       0      0      0      0    247    971      0      0      0      0      0      0       1218      1944     1218    *
*    1944-45       0      0      0      0   1302    714    316      0      0      0      0      0       2332      1945     2574    *
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*    1947-48       0      0      0      0      0      0      0      0      0      0      0      0          0      1948        0    *
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*    1949-50       0      0      0   1023      0      0      0      0      0      0      0      0       1023      1950     3359    *
*    1950-51       0    746   1590   2080    626      0      0      0      0      0      0      0       5042      1951     2706    *
*    1951-52       0      0      0     91    565    360    800    213      0      0      0      0       2029      1952     2029    *
*    1952-53       0      0      0    298    883    749    957    974    108      0      0      0       3969      1953     3969    *
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*    1954-55       0      0      0      0    117     15      0    362      0      0      0      0        494      1955      621    *
*    1955-56       0      0    127    837    778   1150    964    864   1302   1485   1546   1113      10166      1956    11318    *
*    1956-57     695    401    183    108     27    264    404   1103    157      0      0      0       3342      1957     2063    *
*    1957-58       0      0      0      0    751    362    267    768   1028   1368    793    281       5618      1958     6036    *
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*    1960-61       0      0      0      0      0      0      0      0      0      0      0      0          0      1961       34    *
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*    1962-63       0      0      0   1069    599    776    599    905   1209    937    807    685       7586      1963     9697    *
*    1963-64     861    161   1089    847    171     66      0      0      0      0      0      0       3195      1964     1209    *
*    1964-65       0      0    125   1529   2004   2124    917   1766   1681   1067   1987   2432      15632      1965    18367    *
*    1965-66    1825    668    367    763    663   1539   1881   1280   1258   1177   1035   1018      13474      1966    13819    *
*    1966-67     854   1289   1062   1348    472    780   2033   2748   2040   2344   2630   2655      20255      1967    21551    *
*    1967-68    2341   2043    117   1216  *****  *****  *****  *****  *****  *****  *****  *****      *****      1968    *****    *
*    1971-72   *****  *****  *****  *****  *****    608   1144   1008    599    374    646   1243      *****      1972    *****    *
*    1972-73    2343   1663   1423    747   1003   1955   1992   2491    968    583   1971   2980      20119      1973    19706    *
*    1973-74    2063   1565   1389   1014    380   1236    632   1589    838    594   1966   1391      14656      1974    14082    *
*    1974-75    1728   1393   1321   1613   1029   1183   1151    869   1009   2577   2197    680      16751      1975    18299    *
*    1975-76    1764   2248   1978    891   2078   2189   2128   1750   1432   1560   1092   1122      20233      1976    18802    *
*    1976-77    2549   1192    818    714    585    608    133   1008   1025    489    677    606      10405      1977     7847    *
*    1977-78     676    841    484   1424   1780   1933   2358   2828   2576   2163   1095   1061      19218      1978    22714    *
*    1978-79    2918   1244   1336   2319   1646   2029   1827   1749   1114    498    880   1726      19286      1979    19853    *
*    1979-80    1916   2103   2045   1619   1829   2539   2405   2594   1904   1676   1668   2584      24882      1980    25432    *
*    1980-81    2956   1998   1660   1474   1405   1392   1435   1252   1033    748    235    745      16334      1981    *****    *
*                                                                                                                                   *
*    MEAN        596    457    442    671    791    907    872    743    563    489    500    519       7443               7365    *
*    STD DEV     955    721    623    656    785    842    915    834    695    721    753    835       7126               7471    *
*                                                                                                                                   *
```

```
************************************************ STREAMFLOW  SEASONAL  STATISTICS  *************************************************
*                                                                                                            RUN DATE   2/10/82    *
* STN  INDEX    STATION NAME                    WATERSHED                        MEASUREMENTS              GAGE                    *
* NO.  NUMBER   UPPER PAGE DITCH                AREA(KM2)   LATITUDE LONGITUDE   BEGAN  ENDED   CTY  OPER  TYPE    SEASON     PAGE *
*  49  168702     AT DELL AVENUE                    0.0     37/15/57 121/57/12   1968   CON'T    43   43    1U     1981-82       1 *
************************************************************************************************************************************
*                                                                                                     SEASON              YEAR     *
*   SEASON      OCT    NOV    DEC    JAN    FEB    MAR    APR    MAY    JUNE   JULY   AUG    SEPT      TOTAL     YEAR     TOTAL    *
*                                                                                                                                  *
*   1967-68    *****  *****  *****      0    428   1779   1676   1387   1196   1165    413   1211      *****     1968     *****    *
*   1968-69     1294    595    489    619    543    665    308    470   1740   1664   1238   1059      10684     1969      5095    *
*   1969-70     1900   1778   1417   1377    655   2019   1705    824   1366   2110   2533   1842      19527     1970     18653    *
*   1970-71     1452   1134   1635   1415    836    878   1684    733    629   1243   1779   1586      15005     1971     13337    *
*   1971-72     1462    430    661     86      1    265    641    564    280    168    407    996       5963     1972      8471    *
*   1972-73     1667   1547   1848    704    830   1689   1688   1800   1446    863   1614   1867      17564     1973     16310    *
*   1973-74     1447   1274   1086    744    483    838    256   1671   2070   2112   1848   1667      15496     1974     15595    *
*   1974-75     1454   1182   1270   1394    866    860    811    579    581   2165   2090    611      13863     1975     13826    *
*   1975-76     1451   1577    841     90   1201   1323   1097    702    528    437    250     15       9512     1976      7654    *
*   1976-77     1556    365     90     77     13     35     42      4    188     80      7      0       2458     1977       461    *
*   1977-78        2     13      0    831   1394   1641   1706   1720   1461   1203    140    673      10785     1978     15341    *
*   1978-79     1933   1046   1593   1144   1174   1382   1179    944    227     14    221   1148      12005     1979     12633    *
*   1979-80     1942   1828   1429    566   1014   1645   1467   1516   1179   1005    678   1976      16246     1980     15453    *
*   1980-81     2138   1269    999    845    711    758   1209    631    352     29      0      3       8944     1981     *****    *
*                                                                                                                                  *
*   MEAN        1515   1080   1028    707    725   1127   1105    968    946   1018    944   1047      12158               11902    *
*   STD DEV      503    548    563    488    398    578    577    532    597    765    843    679       4610                5136    *
*                                                                                                                                  *
* NOTE:  VOLUMES IN 1000'S OF CUBIC METRES                                                                                         *
************************************************************************************************************************************
```

## DESCRIPTION OF PROPOSED PROJECT

### Reach 1 (See Plates 2 and 3)

Flood control measures for Reach 1 (Station 297+00 to Station 315+00) consist essentially of removal of Kirk Dam and lowering and widening of the existing channel bottom. This results in lowering of the water surface below existing banks to eliminate flooding. Vegetation to be removed in this reach consists mainly of cattails, wild blackberry and giant reed cane presently growing in the existing channel bottom. Hydraulic design procedures utilized in the design allow existing trees and other major vegetation to remain and where excavation occurs in their location, sufficient earth will be left intact to sustain their growth and the surrounding areas protected from erosion with rock or other suitable erosion protection.

Flow velocities resulting from steepening of the channel bottom slope in this reach are potentially erosive if high flows are experienced before natural and planted vegetation are well established. In the event this situation occurs, costs for this reach include $160,000 for the installation of rock erosion protection on an as-needed maintenance basis since the extent of erosion, if any, cannot be readily determined.

Kirk Dam, located in Reach 1, is a structure presently utilized to divert waters from Los Gatos Creek to Kirk Ditch and subsequent outfall into the Camden, Oka Lane, and McGlincey Lane ponds for groundwater recharge. The proposed channel widening in this reach and the fact that any permanent structures extending significantly above the channel bottom would cause upstream flooding, require Kirk Dam's removal. Therefore, a pipeline from Kirk Ditch to Vasona Dam is proposed to allow operation of these recharge ponds with continued utilization of water conserved in the Los Gatos Creek watershed. It is presently planned that this pipeline will be jointly used for the emergency and supplemental water supply system. Alternatives to the pipeline included an inflatable diversion dam, a flashboard diversion dam or an earth spreader dam, each of which proved either too costly or environmentally undesirable. Costs for Kirk Dam removal and installation of the Kirk-Vasona pipeline are included in the estimate.

### Reach 2 (See Plate 3)

Reach 2 (Station 315+00 to Station 323+00) includes lowering and widening of the existing channel bottom together with an excavated floodplain on the west bank provided actual right of way costs do not exceed those estimated for this reach (see "Project Costs"). Should actual right of way costs render the floodplain alternate economically unfeasible, a narrower channel with lined side slopes will be used. On the east bank, maintenance access is planned over the existing paved area in the mobile home park and requires the relocation of one mobile home.

Vegetation and erosion protection in this reach will be dealt with in a manner similar to Reach 1 except that degenerated orchard trees located in the excavated floodplain will be removed and erosion protection in the vicinity of the mobile home park will be sacked riprap or grouted rock due to right of way restrictions. The cost of the potentially required erosion protection for this reach is $71,000, excluding engineering and contingencies.

Reach 3 (See Plate 3)

In Reach 3 (Station 323+00 to Station 331+00) lowering and widening of the channel bottom is proposed together with an excavated floodplain on the east bank. The west bank (west of the low-flow channel) would remain untouched and vegetation considerations for this reach will be similar to those of Reach 2. Considerations for erosion potential for Reach 3 are similar to Reaches 1 and 2 except that erosion protection, if necessary, is to be sacked riprap or grouted rock due to right of way restrictions. The cost for these erosion protection measures is $54,000, excluding engineering and contingencies. Maintenance access along the west bank is planned over Charter Oaks Drive.

Reach 4 (See Plates 3 and 4)

The existing channel in Reach 4 (Station 331+00 to Station 337+00) presently has a relatively large flow capacity and only minor excavation of the east bank will be required. No channel bottom lowering nor alterations to the existing west bank need occur. Vegetation considerations, erosion protection measures and plans for west bank maintenance access are similar to Reach 3. The cost for erosion protection measures for this reach is $13,000, excluding engineering and contingencies.

Reach 5 (See Plate 4)

The bridge at Lark Avenue located in Reach 5 (Station 337+00 to Station 338+30) has sufficient freeboard. However, the constricted channel beneath the bridge causes the upstream design water surface to rise with considerable flooding of adjacent areas. Consequently, the channel beneath the bridge will be widened by steepening and lining the side slopes at the bridge abutments and suitable transitions installed upstream and downstream to prevent erosion.

The stream gage and weir immediately upstream of Lark Avenue will be affected by the proposed measures in this reach. Hence, the estimate for this reach includes costs of gage and weir reinstallation and grouted rock lining at the new weir to prevent overgrowth that would adversely affect gage operation.

Reach 6 (See Plate 4)

Upstream of Lark Avenue, the existing channel deepens and narrows with a relatively mild bottom slope. These conditions combined with heavy vegetative growth cause floodwaters to leave the banks on the east side. Flood control measures for Reach 6 (Station 338+30 to Station 356+20) include removal of impeding vegetation such as cattails in the vicinity of the stream gage at Lark Avenue and giant reed cane throughout the reach and the installation of about 1500 lineal feet of earth berm on the east bank. The berm will be suitably wide on top to allow continuous pedestrian and bicycle traffic on the east bank from Lark Avenue to Vasona Dam. Maintenance access along the west bank is proposed through the parking lots of the industrial development located thereon.

Landscape Concepts (See Plate 5)

Landscaping has been considered as an integral part of the proposed project. Six percent of the project costs are set aside for landscaping. Native and adapted plants will be used to provide for the reestablishment of the viable plant and animal community. Reduction of erosion hazard and the potential for recreational use will be also considered in the development of the landscaping plan. Concepts presented on Plate 5 are general in nature and depict one of the many possible variations available to accomplish these purposes.

Regional Park Potential (See Plate 5)

Design concepts utilized in the plan result in a project that is readily adaptable to recreational joint use. Trails can be incorporated within the watercourse corridor and the natural vegetation augmented with the proposed landscaping will provide an aesthetically appealing setting. The flow of water for groundwater recharge will add considerably to this already pleasant environment. Consequently, both the Town of Los Gatos and the County of Santa Clara have expressed a desire to operate and maintain this reach of Los Gatos Creek as a regional park.

## PROJECT COSTS

Estimates of the construction costs of the proposed channel work on Los Gatos Creek are based upon April, 1975 prices. A contingency item was estimated to account for the costs of engineering, construction inspection, advertising, legal fees, and other contingencies. Estimated costs are presented in Table 3.

## PROJECT FINANCING

The financing of the proposed project would be from the ad valorem tax in the Central Zone of the District. Present tax rate for the Central Zone is 14 cents per one hundred dollars assessed valuation and the current estimated annual income is $1,876,000. The current assessed valuation of the Central Zone will provide an adequate source of funds from the current level of ad valurem taxes to finance the project as recommended.

## CONSTRUCTION STAGING

Geographical conditions and existing population density for the study reach are such that the project does not readily lend itself to satisfactory construction staging. If downstream measures are performed first, upstream flooding would still flow into downstream populated areas. Upstream measures rely on downstream construction to lower flood water surface elevations and hence would be inadequate if performed first. Consequently, it is recommended that construction for the entire project be performed simultaneously. Because of the joint use of the pipeline for the emergency supply system, funds for its construction will be budgeted in 1976-77. The exact schedule for construction of the proposed flood control measures is dependent upon the scheduling of other Central Zone flood protection projects. Indications at this time are that this project will be constructed within the next five years. As stated earlier, a principal purpose for this study and its adoption is to assist land use planning in the area.

## TABLE 3

## ESTIMATED PROJECT COSTS

| Reach | Station Limits | Construction | Engineering and Contingencies | Right of Way | Total |
|---|---|---|---|---|---|
| 1 | 297+00 to 315+00 | $381,000 | $133,000 | $ 49,000 | $563,000 |
| 2 | 315+00 to 323+00 | 188,000 | 66,000 | 216,000 | 470,000 |
| 3 | 323+00 to 331+00 | 161,000 | 56,000 | 40,000 | 257,000 |
| 4 | 331+00 to 337+00 | 77,000 | 27,000 | - | 104,000 |
| 5 | 337+00 to 338+30 | 11,000 | 4,000 | - | 15,000 |
| 6 | 338+30 to 356+20 | 120,000 | 42,000 | 15,000 | 177,000 |
| | | | TOTAL PROJECT COST | | $1,586,000 |

## CONCLUSIONS AND RECOMMENDATIONS

As a result of the investigation of Los Gatos Creek between Kirk Dam and Vasona Dam reported herein, it is concluded that:

1. The existing channel is not adequate to convey the design flood flows in the study reach and flooding of adjacent urban land areas will occur.
2. An acceptable flood prevention project can be constructed to protect the area.
3. Landscaping of the project area is considered an important part of the project.
4. The estimated total cost for the proposed project including con-

struction, engineering, right of way, landscaping, and contingencies is $1,586,000.

5. Until flood protection measures are installed, acquisition of necessary rights of way for selective channel clearing in accordance with this report should be undertaken. This will provide some additional protection in the interim period.

Based on these conclusions, it is recommended that the project plan as presented herein be adopted and that construction be undertaken when Central Zone financing will allow. However, in the meanwhile, right of way acquisition should proceed so maintenance activities (selective channel clearing) can be implemented.

The adoption of these recommendations will provide a guide for ongoing community development in the project area.

Prepared by:

Richard J. Pardini

Richard J. Pardini
Associate Civil Engineer
Predesign Division

Submitted by:

W. F. Carlsen

W. F. Carlsen
Division Engineer
Predesign Dvision

Approval Recommended:

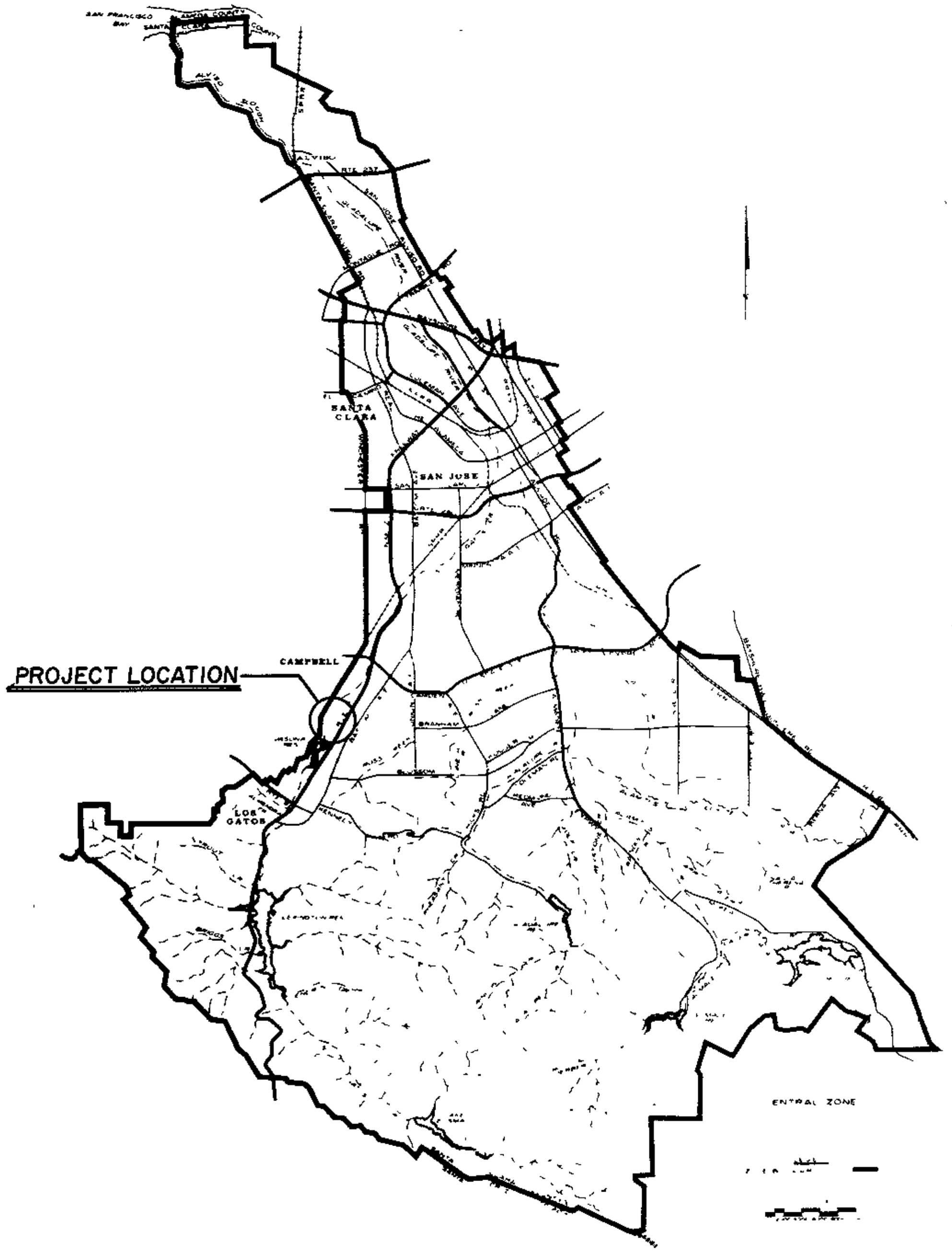
John L. Richardson

John L. Richardson
Head, Project Development Branch
Design and Construction

Approved:

George Korbay

George Korbay
Design and Construction Manager



# MAP AND GENERAL PLAN

FOR

# LOS GATOS CREEK

## (KIRK DAM TO VASONA DAM)

**Santa Clara Valley Water District**

**CENTRAL FLOOD CONTROL ZONE**

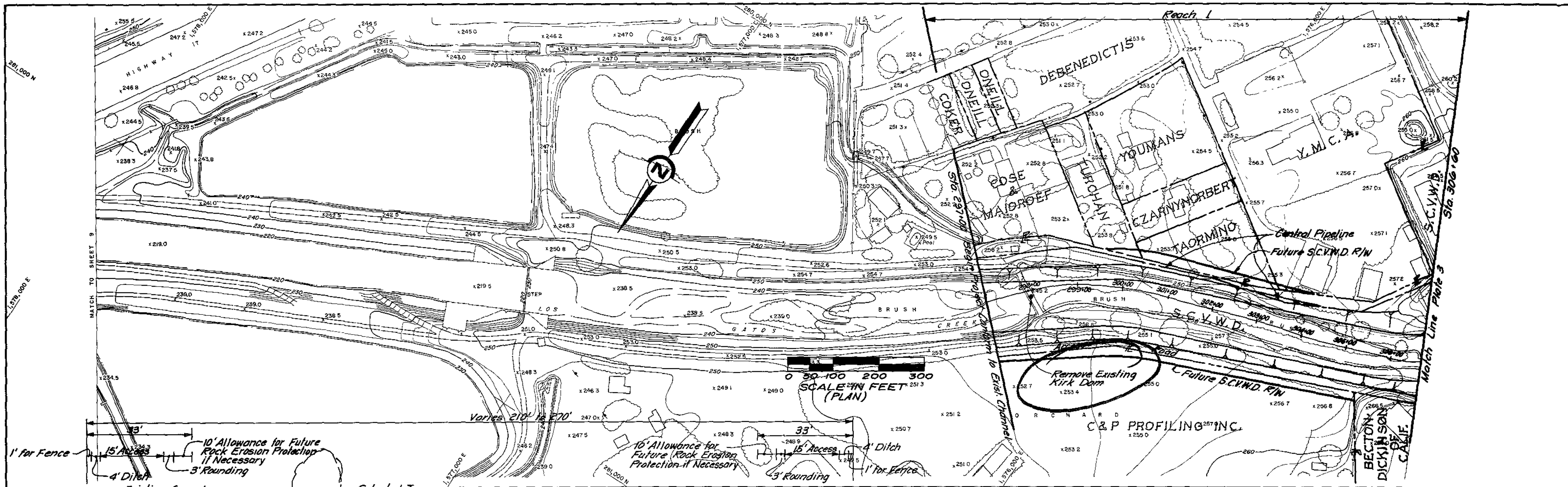
**PROJECT NO. 3020**

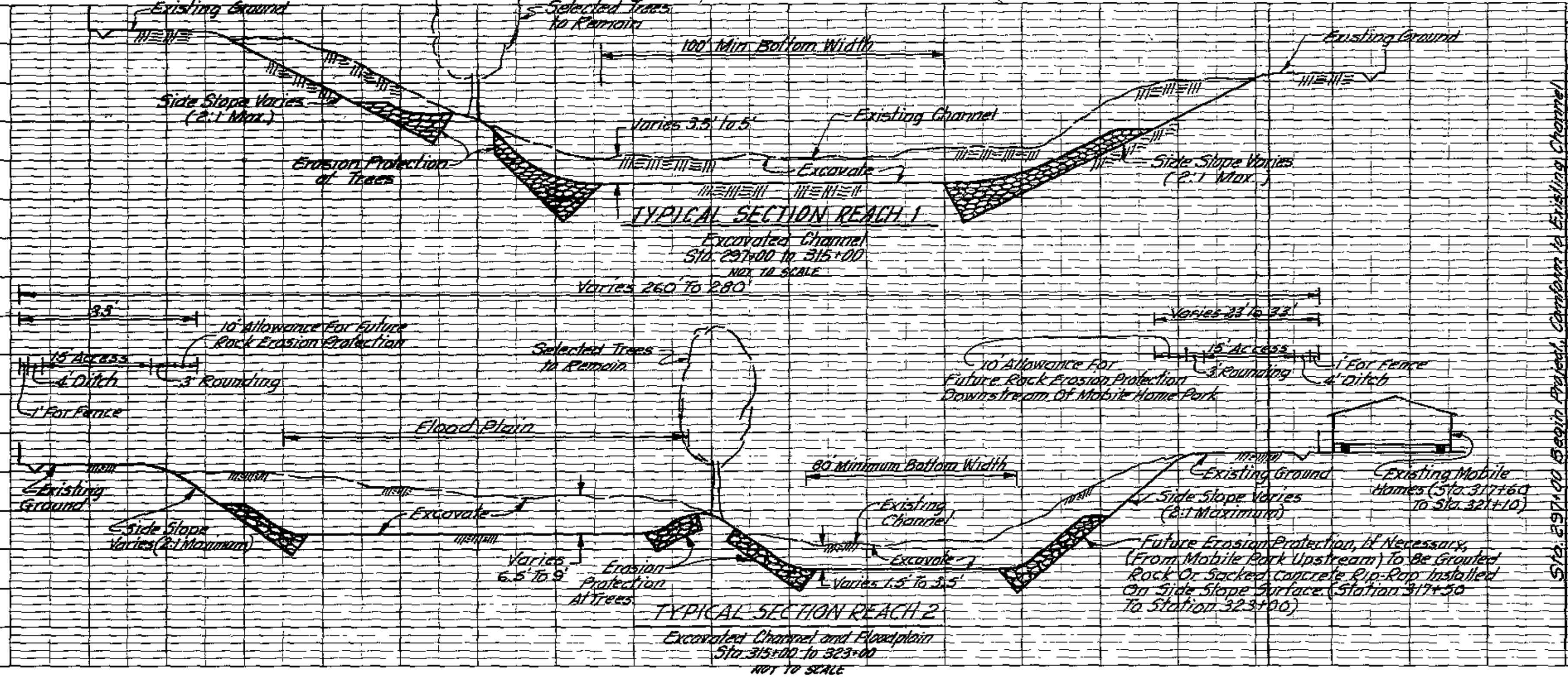
PROJECT APPROVAL:

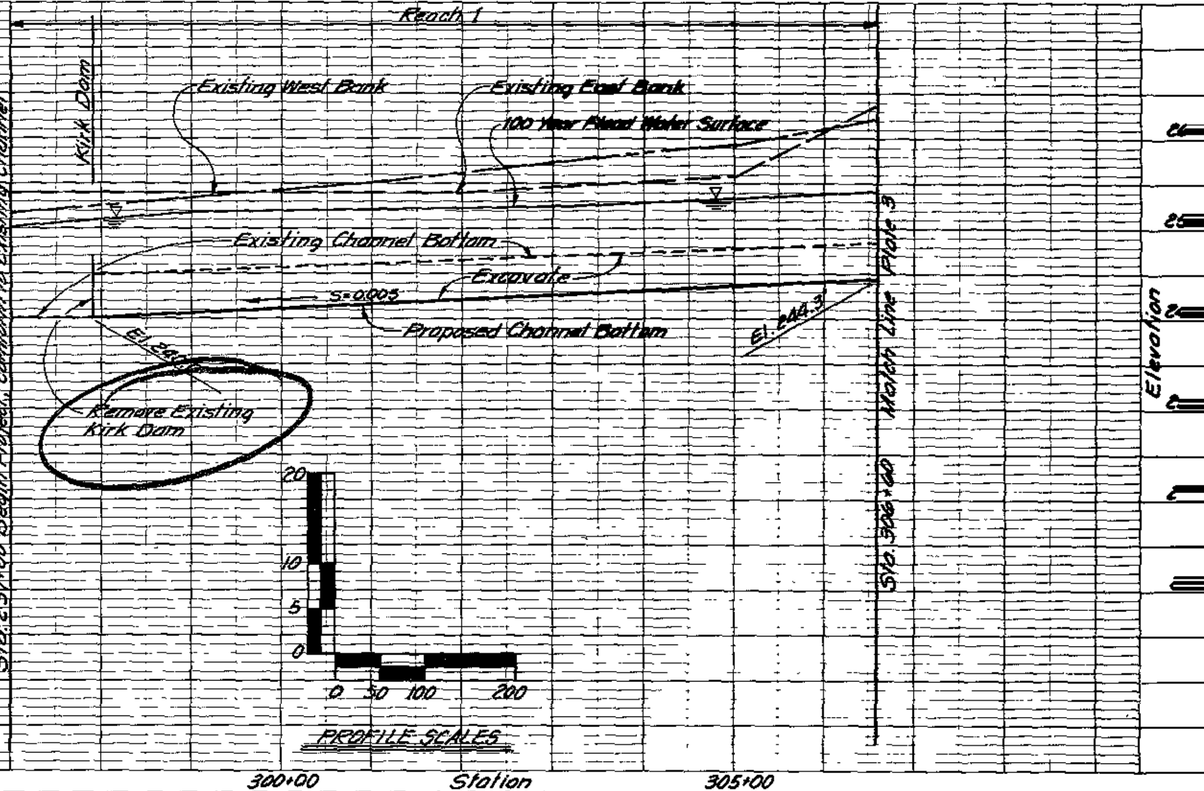
George Korbay
DESIGN AND CONSTRUCTION MANAGER

Lloyd C Fowler
CHIEF ENGINEER

DATE. 19 Feb '76




Existing Ground
Selected Trees to Remain
100' Min. Bottom Width
Existing Ground
Side Slope Varies (2:1 Max.)
Varies 3.5' to 5'
Existing Channel
Excavate
Side Slope Varies (2:1 Max.)
Erosion Protection of Trees
TYPICAL SECTION REACH 1
Excavated Channel
Sta. 297+00 to 315+00
NOT TO SCALE
Varies 260' To 280'
33'
10' Allowance For Future Rock Erosion Protection
15' Access
4' Ditch
3' Rounding
1' For Fence
Selected Trees to Remain
Varies 23' to 33'
10' Allowance For Future Rock Erosion Protection Downstream Of Mobile Home Park
15' Access
3' Rounding
1' For Fence
4' Ditch
Flood Plain
80' Minimum Bottom Width
Existing Ground
Existing Ground
Existing Mobile Homes (Sta. 317+60 To Sta. 321+10)
Side Slope Varies (2:1 Maximum)
Side Slope Varies (2:1 Maximum)
Excavate
Existing Channel
Excavate
Varies 6.5' To 9'
Erosion Protection At Trees
Varies 1.5' To 3.5'
Future Erosion Protection, If Necessary, (From Mobile Park Upstream) To Be Grouted Rock Or Sacked Concrete Rip-Rap Installed On Side Slope Surface (Station 317+50 To Station 323+00)
TYPICAL SECTION REACH 2
Excavated Channel and Floodplain
Sta. 315+00 to 323+00
NOT TO SCALE



REFER TO TRACING FOR LATEST REVISION

| REV. | DESCRIPTION | SUB | APPR |
|---|---|---|---|
| | | | |

NOTES.
1. FOR LANDSCAPING CONCEPTS, SEE PLATE 5.
2. ℞ - INDICATES EXISTING PROPERTY LINE

DATE OF PHOTOGRAPHY DECEMBER 19, 1973

BASE MAP PREPARED BY Towill, Inc.

4232-0

DATE Dec. 1975
DESIGN R Pardini
DRAWN RJB
CHECKED R. Pardini

Santa Clara Valley Water District

ENGINEERING CERTIFICATION
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PROJECT ENGINEER
DIVISION ENGINEER
R.C.E. NO.

ENGINEERING APPROVAL
John L. Richardson
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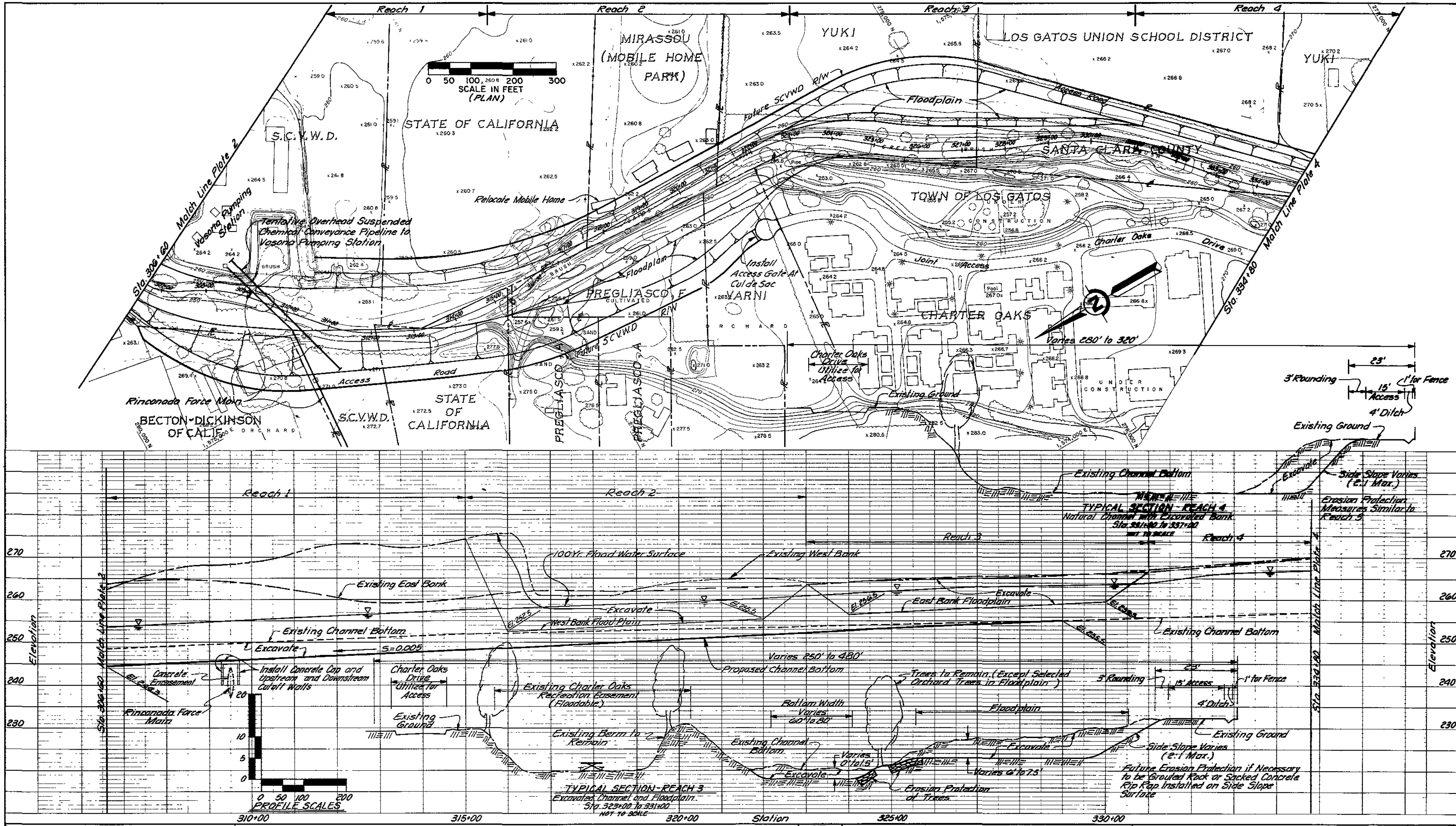
## MAP AND GENERAL PLANS

ZONE C-1 (CENTRAL) PROJECT NO. 3020

# LOS GATOS CREEK

SCALE As Sh
PLATE 2 OF 5



| REFER TO TRACING FOR LATEST REVISION | | | |
|---|---|---|---|
| REV | DESCRIPTION | SUB. | APPR. |
| | | | |

NOTES
1. FOR LANDSCAPING CONCEPTS, SEE PLATE 5.
2. ℞ - INDICATES EXISTING PROPERTY LINE.

DATE OF PHOTOGRAPHY DECEMBER 3, 1973 BASE MAP PREPARED BY Towill, Inc.

| | |
|---|---|
| DATE | Dec. 1975 |
| DESIGN | R. Pardini |
| DRAWN | RJB |
| CHECKED | R. Pardini |

**Santa Clara Valley Water District**

ENGINEERING CERTIFICATION
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PROJECT ENGINEER
D. F. Carlson
DIVISION ENGINEER R.C.E. NO. 16[illegible]

ENGINEERING APPROVAL
John L. Richardson
HEAD, PROJECT DEVELOPMENT BRANCH R.C.E. NO. 17646

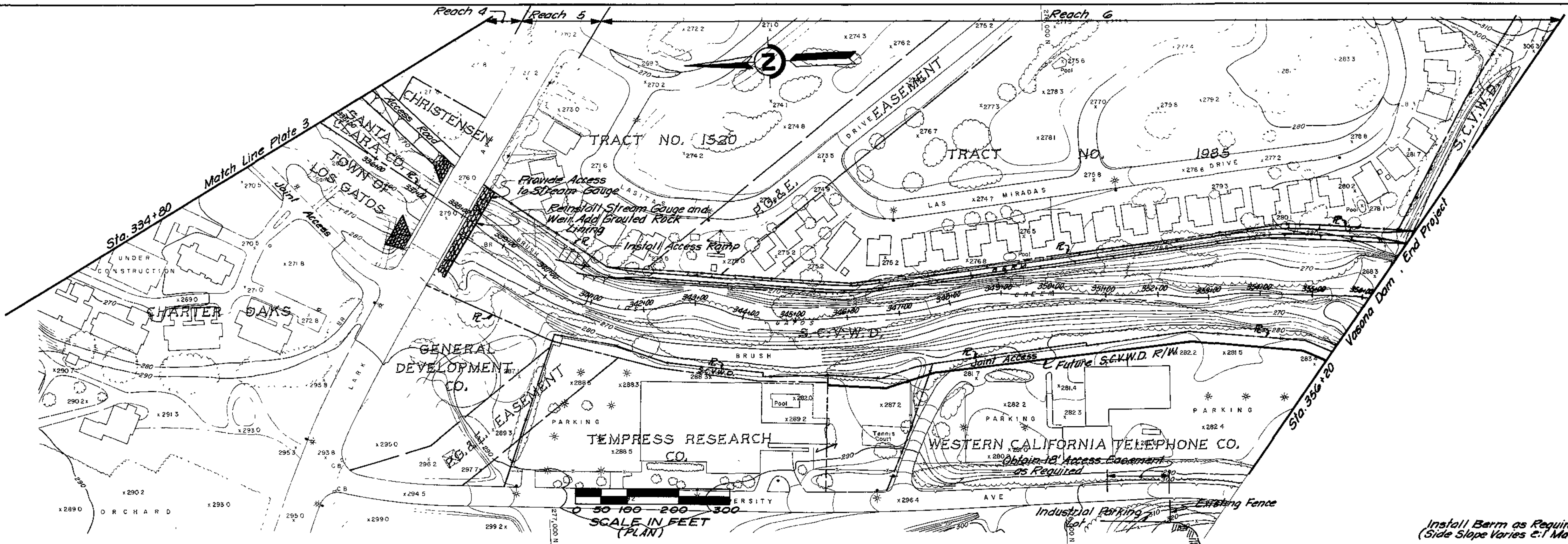
**MAP AND GENERAL PLANS**

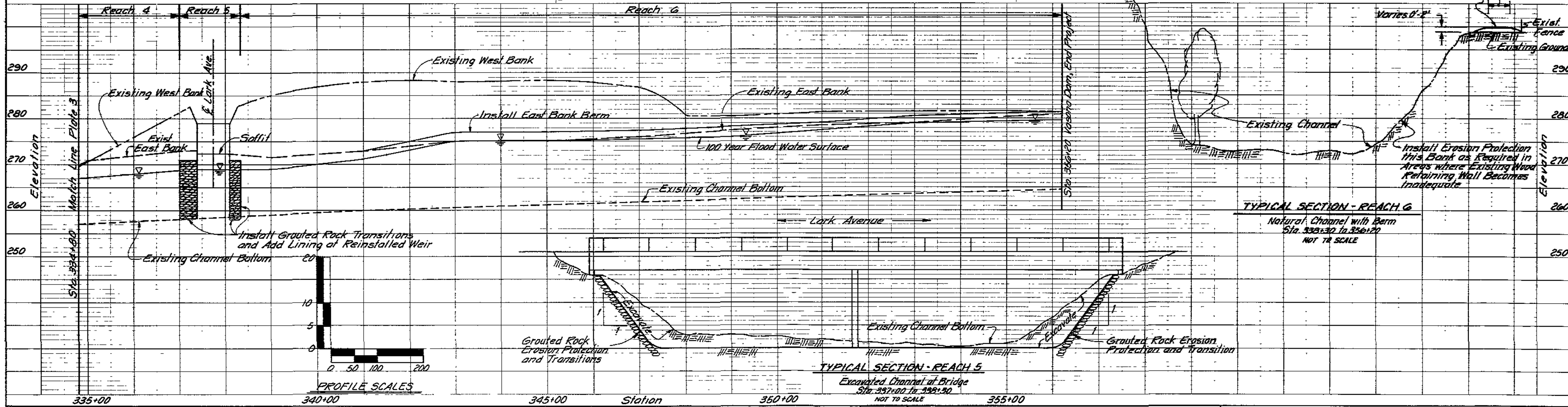
ZONE C-1 (CENTRAL) PROJECT NO. 3020

**LOS GATOS CREEK**

SCALE As Shown
PLATE 3 OF 5

4232-0




Reach 4
Reach 5
Reach 6
Match Line Plate 3
Sta. 334+80
℄ Lark Ave.
Sta. 356+20 Vasona Dam, End Project
Elevation
290
280
270
260
250
Existing West Bank
Exist. East Bank
Soffit
Install East Bank Berm
Existing East Bank
100 Year Flood Water Surface
Existing Channel Bottom
Install Grouted Rock Transitions and Add Lining at Reinstalled Weir
20
10
5
0
0 50 100 200
PROFILE SCALES
335+00
340+00
345+00
Station
350+00
355+00
Lark Avenue
Grouted Rock Erosion Protection and Transitions
Excavate
Existing Channel Bottom
Grouted Rock Erosion Protection and Transition
TYPICAL SECTION - REACH 5
Excavated Channel at Bridge
Sta. 337+00 to 338+50
NOT TO SCALE
Install Berm as Required (Side Slope Varies 2:1 Max.)
Varies 8' to 10'
Varies 0'-2'
Exist. Fence
Existing Ground
Existing Channel
Install Erosion Protection this Bank as Required in Areas where Existing Wood Retaining Wall Becomes Inadequate
TYPICAL SECTION - REACH 6
Natural Channel with Berm
Sta. 338+30 to 356+20
NOT TO SCALE

| REFER TO TRACING FOR LATEST REVISION | | | |
|---|---|---|---|
| REV | DESCRIPTION | SUB | APPR |
| | | | |

NOTES
1. FOR LANDSCAPING CONCEPTS, SEE PLATE 5.
2 ℞ - INDICATES EXISTING PROPERTY LINE.

DATE OF PHOTOGRAPHY DECEMBER 9 1973

BASE MAP PREPARED BY Towill, inc.

4232-0

| | |
|---|---|
| DATE | Dec. 1975 |
| DESIGN | R Pardini |
| DRAWN | RJB |
| CHECKED | R.Pardini |

**Santa Clara Valley Water District**

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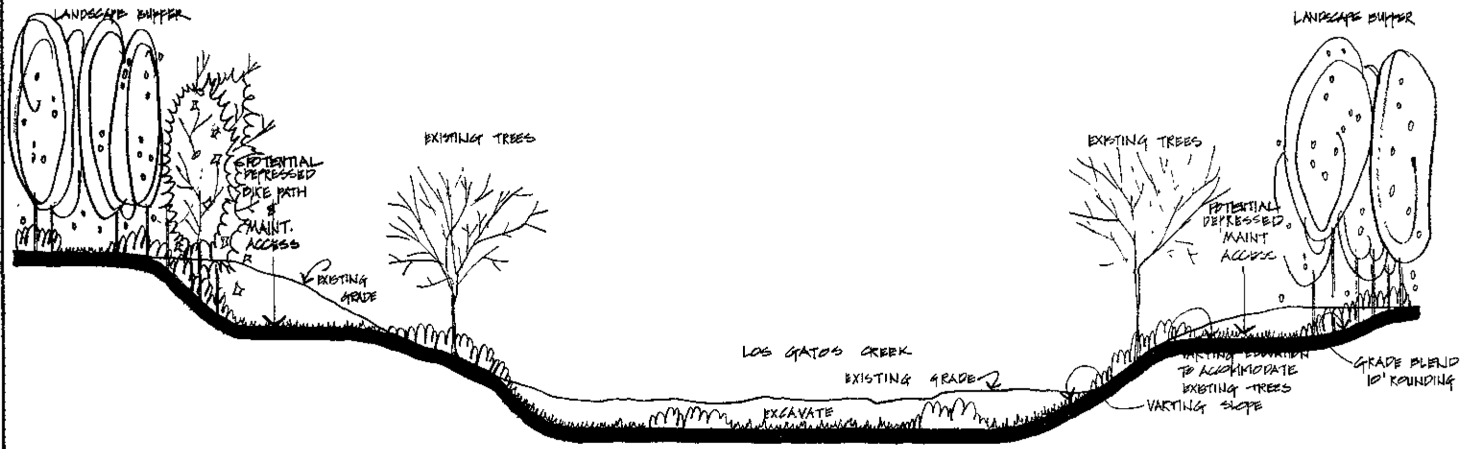
# MAP AND GENERAL PLANS

ZONE C-1 (CENTRAL) PROJECT NO. 3020

# LOS GATOS CREEK

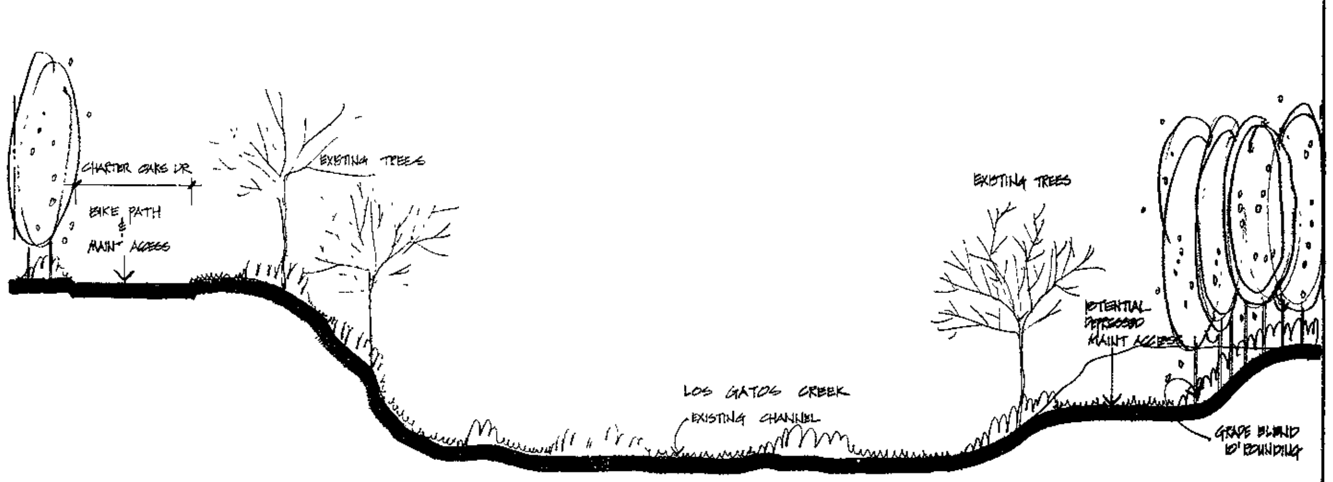
SCALE
As Shown

PLATE
4
OF
5



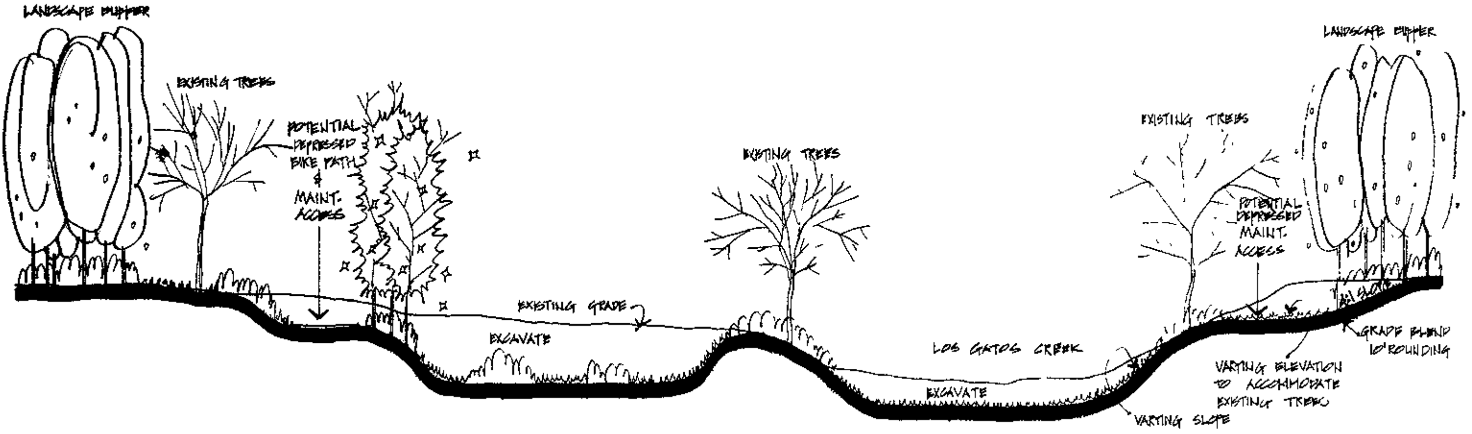
TYPICAL SECTION - REACH 1

EXCAVATED CHANNEL
STA. 297+00 to 315+00



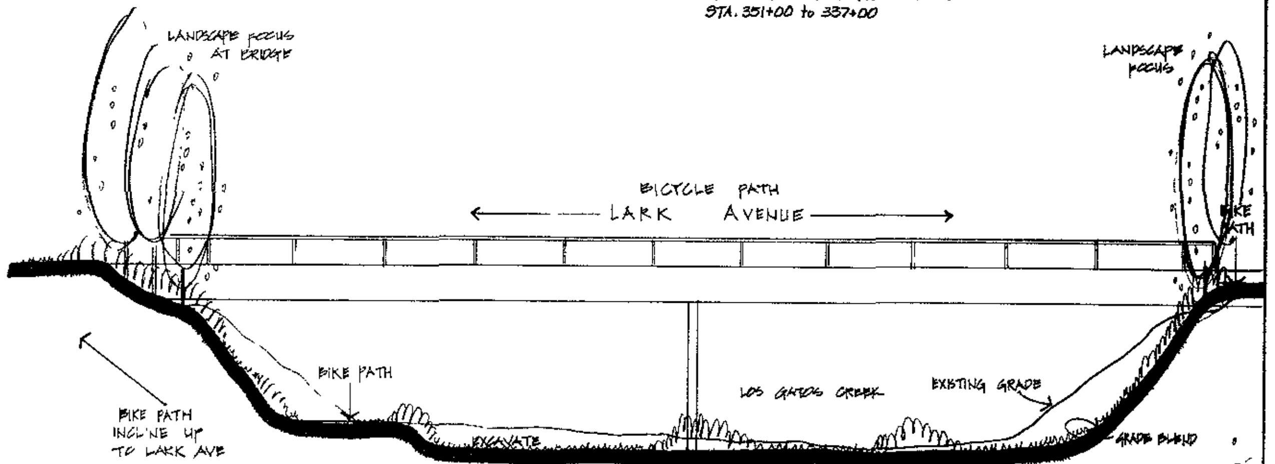
TYPICAL SECTION - REACH 4

NATURAL CHANNEL WITH EXCAVATED BANK
STA. 331+00 to 337+00



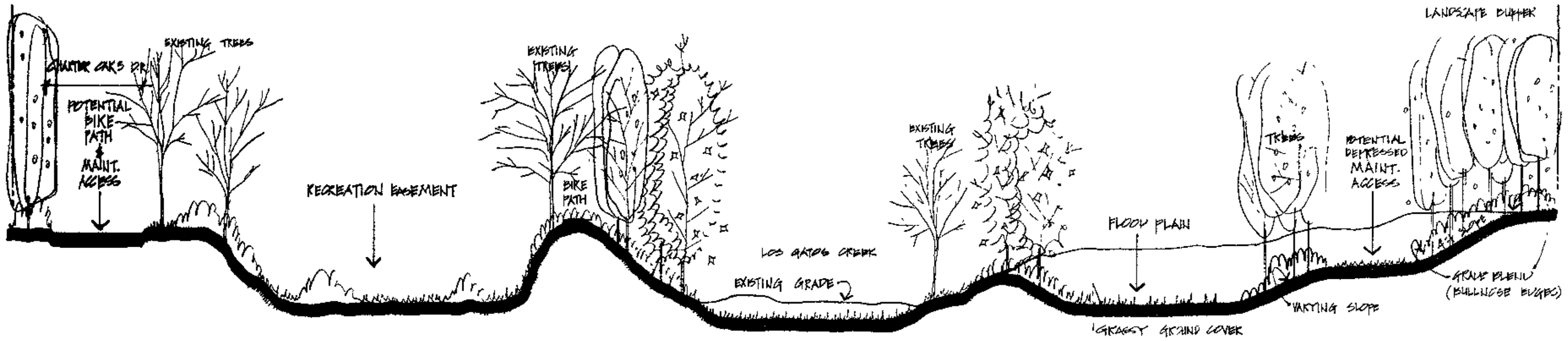
TYPICAL SECTION - REACH 2

EXCAVATED CHANNEL AND FLOODPLAIN
STA. 315+00 to 323+00



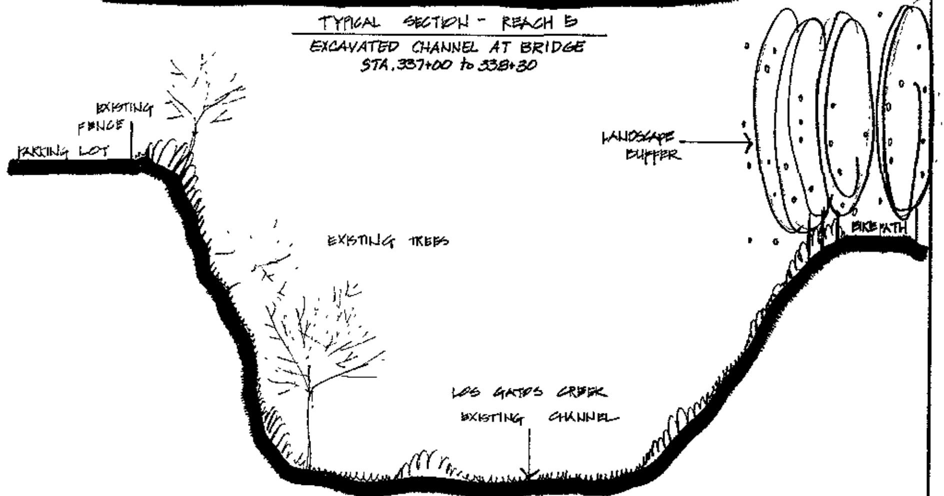
TYPICAL SECTION - REACH 5

EXCAVATED CHANNEL AT BRIDGE
STA. 337+00 to 338+30



TYPICAL SECTION - REACH 3

EXCAVATED CHANNEL AND FLOODPLAIN
STA. 323+00 to 331+00



TYPICAL SECTION - REACH 6

NATURAL CHANNEL WITH BERM
STA. 338+30 to 356+20

REFER TO TRACING FOR LATEST REVISION

| REV | DESCRIPTION | SUB |  |
|---|---|---|---|
|  |  |  |  |

1. ALL TYPICAL SECTIONS LOOK DOWNSTREAM

DEC 1975
S. RENFRO
S. RENFRO
K. PARDINI

Richard J. Pardini
W. [illegible] Carlson 16464
John L. Richardson
HEAD, PROJECT DEVELOPMENT BRANCH R.C.E. NO. 17644

**Landscape Concepts**

SCALE NO SCALE
PLATE 5 OF 5